

DECEMBER 2013

THE MONTHLY NEWSLETTER of the SANTA CRUZ COUNTY AMATEUR RADIO CLUB

# SHORT SKIP



## Antenna Efficiency 101

Ask a typical Ham how efficient are your antennas and the answers you receive are likely to include the following. My dipole is the most efficient for all-round use. My vertical is not efficient except for long distance. Gee I dunno. The first two have confused effectiveness with efficiency, the third answer indicates someone who is either rather dumb or quite astute.

Effectiveness indicates how well an antenna gets RF to and from areas of interest. The topic provides endless opportunity to discuss our experiences that most likely will be qualitative in nature. A great deal of entertainment and knowledge can be learned in this way and long may it continue but it begs the question how much energy is put to good use and how much is wasted. The third individual could have a scientific understanding and knew it isn't an easy question to answer.

Our attempts to improve the overall efficiency of an antenna system as whole usually include measuring the SWR from the transmitter towards the antenna but this tells us little about radiation efficiency, even if we assume there is no loss in the line and that we have a perfect match. A dummy load is or should be a poor radiator. Fortunately we have antenna modeling programs that rely on mathematics, scientific concepts and definitions to derive figures for efficiency.

Our most basic concept is an elemental antenna called a point source. It is a purely fictitious antenna whose radiation pattern is isotropic, meaning equal in all directions. Any aspect of antenna behavior including efficiency can be modeled by assuming they are made up of a very large number of point sources. We are concerned both with efficient RF power transfer from a source to a load, either from a transmitter to space or from an incoming wave-front to the input of a receiver, and with power wasted in the process.

An antenna modeled in free space is absent ground losses and will behave as a pure resistance  $R_a$  at resonance. A source of power, either gathered in the receive direction or generated by a transmitter, is modeled in series with  $R_a$ . Given estimates of ground and other losses, the model will calculate the total series resistance  $R_t$  comprising the desirable dissipation in  $R_a$  and the undesirable loss  $R_t$  and intrinsic antenna efficiency is the ratio of  $R_a/R_t$ . A caution is that while the computer accurately gives us  $R_a$ ,  $R_t$  is subject to actual ground and other losses that are usually not well defined. A more satisfactory solution is to make actual measurements that give us a value for  $R_t$  and then base our  $R_a/R_t$  efficiency ratio on it.

This is all good but radio engineers came up with additional concepts known as aperture and effective height that are intended to help us understand why antennas behave as they do. These concepts were introduced long before we amateurs had computer software and arguably are less helpful than they used to be. However you will no doubt encounter them so some explanation is in order.

It is a little easier to consider the aperture of a RX antenna and loops, horns or dishes have an obvious physical area/aperture for intercepting an incoming wave. It is obvious that the loop area and the power of the wave (Watts per square meter) would be related to the power delivered to the antenna terminals. You may well ask what are the apertures of other antennas such as a wire dipole or our reference point source. They do have an aperture or they wouldn't function but bearing in mind antenna aperture is conceptual, it isn't surprising that mathematics is needed to fully answer that question.

Before we conclude let me muddy the water even more. Engineers came up with several

Continued page 3

## Letter from the President

I Just wanted to thank all of you for a wonderful 2 years as your President. As you know this weekend will be when the new board will start and take us through the end of next year.

We have done some pretty major projects the last few years including many things with the K6BJ Repeater. One Big task was removing our tower off the building that was to be demolished, rig something back together to keep the repeater functioning while the building was demolished, come up with many different ideas on ways to build a new tower, decide on a new tower, Start building.

Right now tower construction is almost finished although there is still more little but time consuming things to be done such as, wait for concrete to cure at the base of the new tower, wiring for antennas, getting antennas ready to be mounted, mounting and then adjusting antennas as required. All of this could not have been accomplished without ALL of those that came and volunteered their time to help. I would love to list off the names of the people for you to see but the list would be a good size and would make this email too long.

I would Like to thank all of those that came and helped with any part of the project along the way.

I would like to take this time now to introduce your New President Suellene Petersen K6CPA.

I would like to welcome Suellene as our new president and I look forward to seeing what new ideas she will have for us.

Thank you all.  
Robert Ritchey, KJ6FFP

**CLUB MEETING FRIDAY JANUARY 17, 7:30PM**



Dec 7th

We were all over-joyed to hear from San KK6GMH that she had just passed the EXTRA Class test. What a terrific achievement !!

The session was unusual in that most of the time was taken up with a stimulating presentation from Glen KGOT. This was an in-depth story of including a mini-microprocessor to integrate the band switching capabilities of the Elecraft KX3, with an external linear, antenna tuner and antenna switch. Glen is clearly inventive and at-home with technical detail but very willing to take input from others; In this instance two Elecraft experts Bob K6XX and David KG6IRW. David amplified Glen's talk by drawing the overall schematic and data paths.

Glen was interested in the frequency stability of the KX3 relative to JT65. This led to a discussion about temperature control and the implications of high duty-cycle data on the heat load of an amplifier. Oliver KJ6LDD briefly described his experience with the professional datacom product PACTOR. We would like to hear more about this Oliver. Amplifier Guru Bob K6XX then discussed the efficiency temperature-characteristic of linear amps in general. Ron W6WO privately wondered why we hams seldom refer to PowerAddedEfficiency (PAE) when this subject comes up. For more info on how PAE relates output power to gain and harmonic distortion contact Ron. Smith charts anyone ?

Ron showed his project of an RF probe designed to detect the external current flow on a coax shield. This is a useful but imprecise way to check the effectiveness of a Balun (other story entirely and one of Ron's pet peeves). The morning concluded with snap shot of a presentation he is working on that deals with several misconceptions many of us have about ionospheric propagation. Circular polarization is a key factor and Gary K6PDL found an animated graph that illustrated this. It became apparent that challenging the status quo in a future talk will not be easy.

It was an exceptional meeting and I hope we will make more use of the projection facilities.

Dec 21

A diverse and talented group showed up today and we had a lively meeting as you

would expect from Tom kW6S David KG6IRW Frank K6BDK Reed N1WC Glen KGOT Kerry K3RRY Don K6GHA, Bob K6XX K9YC and Ron W6WO. We made some good use of the "chalk board" and projection capabilities, and also passed round some items of interest. Seems like our perennial topics relate to antennas, baluns and transmission lines.

Glen listed two programs MMANA for antennas and TLD for transmission lines that he has been enjoying, he showed a RigExpert analyzer which goes far beyond making simple impedance measurements (Ron's favourite BTW) and Glen also brought a single port VNA which he likes a lot

Kerry and Don were huddled over towers for sale for much of the time, their quest seems to be finding out the most reasonable price required to buy a 70 ft self supporting. Ron commented you might pay more for the foundation than for the tower itself.

Bob gave an expert presentation describing how 2-3 QRO amps could be combined with low insertion loss and his results were truly impressive

San asked about a Windom antenna and Ron explained it was an example of an off-center fed dipole Her follow up question was why OCF. (It is truly refreshing to meet someone with meaningful "why" questions). It was explained they offer an alternative to center-fed that might suit a site better.

Jim K9YC did a brilliant job using the projector to illustrate the way common-mode chokes are used to constrain current on the shield of a coax cable connected to a balanced antenna. Jim also showed a few of the capabilities of SimSmith developed by Ward AE6TY, a local talent.

Ron brought a converter he built to shift the LF spectrum below 500 kHz to the 3.5-4.0 MHz 80m band. This LF region has its own core of enthusiasts as lots of ionospheric research occurs there and it is possible to obtain an experimental transmission license somewhere around 140 KHZ. It seems counter-intuitive that a 6ft whip and a single transistor can be a very effective combination for reception only aka active antenna.

Ron has been looking for a certain book for well over a year and has just found one. This book is entitled Electromagnetic waves by Shelkunoff published in 1941 and it will be his XMAS present.

Ron thanked one and all for their continued support of these sessions and mentioned that we have the use of the facilities 1st and 3rd Saturdays through March 2014 thanks to Michael AG6MK

## Those other dBs

Have you noticed how fast young people talk and how fast they grasp new things? These days we equate speed with intelligence and I suppose there is at least some justification. In the racks processors used by Google one can imagine the zillions of on-off switches. However software which is where the real intelligence resides Our ability to absorb and process information is rather like that. Our processes slow down as we age and this means we cope with less hardware and our software just takes more time. We could use a metric and standards points of reference that go beyond raw speed, that could be called Delayed Brainpower (DB). .A infant absorbs and processes information faster than anyone this could be our base in DBi (rather like our conceptual unfocused isotropic radiator). As adolescents and adults are hard to distinguish, their metric would be DBa while middle age would be DBm and at death DBd (in negative amounts)



What's my DBd numbers now Doc ?

## Treasurer's Report

The October 31, 2013 Treasurer's Report presented to the Board of Directors showed that the SCCARC treasury had \$3425.17 in cash and bank accounts (total less encumbrances: \$2798.17). At that time all financial obligations for which invoices had been received had been met. The full Report, incorporating the current working budget as well as actual and projected income and expenditure figures for the full calendar year, is available for on request from Kathleen KI6AIE at [ki6aie@k6bj.org](mailto:ki6aie@k6bj.org).



Ron K6EXT and Cap KE6AFE



By Art Lee WF6P

## CHATTER

Our November meeting was a great success with rows of tables filled with desirable auction items. There was the usual dearth of ham gear and nobody wanted the key and code practice oscillator. Some pretty exotic pieces of equipment were placed on the block, finding new happy and satisfied owners. In some cases, pals successfully bid on items that were immediately given as gifts to fellow hams. Some recipients of these "gifts" weren't sure they were truly useful (?). I felt the same way when Bruce, AC6DN, placed a winning bid for a 6"x4" "The Jazz Cruise 2013" calculator, and promptly said it was for me. I didn't need another calculator but when I got it home I found it to be great! Not only did it have batteries, large-face print, but it looked to be waterproof and might even float. If I found a use for it while sailing, I'm sure it would survive even a spinnaker knockdown. Thanks Bruce.

Oliver, KJ6LDD, procured and gathered most of the auction items from various sources. Some were minimum bid, some were donations and others were "You gotta take 'Ädem home" items. His sidekick, Don, K6GHA, did a fantastic job with his running banter and humorous comments, providing us with the evening's entertainment. Don has done this a couple of years in the past, is a natural, and good at it. Oliver is placing the unsold items on Ebay.

Our annual election of officers was held and a great slate of officers agreed to serve the club. Suellene, K6CPA, is our new club president. Congratulations to all the new officers. The search committee did a good job, a difficult task at times. I recall that a few decades ago when we met in a bank on 41st avenue, we posted the election results on an erasable board. After the election count, we erased the board and all went home. We forgot to record who we voted in! It took some head scratching to reconstruct the results.

When I asked Tom Stoller, KW6S, if he was still in the electronics engineering and sales business he told me he has been involved

in a project dealing with pilotless aircraft. Interesting. I didn't ask him if Amazon or UPS were partners.

Don Moore, W6IBN, has moved from Paradise Park to the Masonic Home in Fremont, south of Hayward. Years ago when Don and I visited the home, we toured the well laid out ham shack they have on one of the upper floors. Myron Coleman, K6RRU, a Paradise Park former neighbor of Don's, and I will have to go to see if it is still operational. The resident hams mounted a tri-element beam on the roof.

## SCCARC Board for 2014

At the November 15, 2013 meeting of the Santa Cruz County Amateur Radio Club, the following were elected to serve on the Board in 2014. They take office as of the day of the 2013 Holiday Luncheon.

Officers can serve at most two consecutive years in the same position. Other directors have no term limit.

President: Suellene Petersen K6CPA (1st year)

Vice-President: Michael Usher AG6MK (1st year)

Secretary: David Copp WS2I (2nd year)

Treasurer: Kathleen McQuilling KI6AIE (2nd year)

Immediate Past President: Robert Ritchie KG6FF

Director: Bruce Hawkins AC6DN

Director: Ray Matteis KE6NHG

Director: Oliver Pitterling KJ6LDD

Director: Becky Steinbruner KI6TKB

## Antenna 101 continued

other concepts of aperture, one called the scattering aperture can be understood in the context of the maximum power transfer rule between source and load. In the receive direction  $R_a$  becomes the internal impedance of the source delivering power to the radio. In the matched case only 50% of the incoming power is absorbed by the receiver and the remainder is retransmitted /scattered back to space. Amazing at it may seem your receiver becomes a QRP transmitter. In contrast, with matched conditions all our TX. power entering the antenna is transmitted. We typically fuss with impedance matching for our output power while neglecting matching for transfer of received power.

The concept of virtual height is best understood in the context of a vertical antenna. An incoming plane wave has a strength measured in Volts/m. IF this is truly vertically polarized on arrival big IF big topic to be discussed separately then the ratio of the incoming field strength and actual voltage at the antenna terminals becomes the effective height in meters. Seems reasonable but how does this apply to antennas other than a vertical. Much like the similar point for aperture, effective height is conceptual and isn't equivalent to actual height; we must rely on math, measurements and models to apply it to actual cases.

Winter is the ideal time to model antennas leaving the making and measuring to the spring.

BCNU OTA Ron W6WO

## Special Event Stations Educate and Entertain

By Dan Romanchik, KB6NU

I like special event stations. I enjoy operating them and making contact with them. Whenever I operate WA2HOM, our club station at the Ann Arbor (MI) Hands-On Museum, one of the first things I do is to search for special event stations.

One of the reasons I enjoy operating special event stations is that it's educational. For example, on November 17, I worked W4D in Mayaguez, Puerto Rico. They were commemorating the 520th anniversary of the discovery by Europeans of the island of Puerto Rico. As a result, I learned that on November 19, 1493 Christopher Columbus landed on the island, naming it San Juan Bautista in honor of Saint John the Baptist, a name that was later changed to Puerto Rico (rich port).

Working special event stations is also entertaining. Most times when you work a special event station, you can tell that they're having

a good time. One time, I worked W4B, operating from the Kentucky Bourbon Festival. Now, those guys were really having a great time!

How do you find special event stations?

One way to find special event stations is to just tune around. Most special event stations will be operating at least a 20m phone station, so take a look at that band first. Also, consult the special event stations listings in QST or on the ARRL website (<http://www.arrl.org/special-event-stations>). KE2YK also has a special events page (<http://ke2yk.wordpress.com/special-event-station-events/>).

In addition to working special event stations, you should consider organizing and operating one of your own. For the past two years, several members of our Rotary Club who are also amateur radio operators have operated W8P on the third weekend in February, which commemorates the founding of the Rotary Club and helps spread the word about the End Polio Now campaign (<http://www.endpolio.org/>). It

### SCCARC Board - 2013

President	Suellene Petersen K6CPA		
Vice President	Michael Usher AG6MK		
Secretary	David Copp	WS2I	708-2206
Treasurer	Kathleen McQuilling	KI6AIE	476-6303
Directors	Bruce Hawkins AC6DN		
	Ray Matteis KE6NHG		
	Oliver Pitterling KJ6LDD		
	Becky Steinbruner KI6TKB		
(Immediate Past Pres.)	Robert Ritchey	KJ6FFP	
K6BJ Trustee	Allen Fugelseth	WB6RWU	475-8846

### MONTEREY BAY REPEATER ACTIVITY

Santa Cruz County	K6BJ 146.790- PL 94.8 Santa Cruz (linked to KI6EH) KI6EH 147.945- PL 94.8 Watsonville (linked to K6BJ) K6BJ 440.925+ PL 123.0 Santa Cruz (not linked) K6BJ D-Star 441.675 +5MHz (D Star link: <a href="http://tinyurl.com/dstar-sc">tinyurl.com/dstar-sc</a> ) • SCCARC Net Monday 7:30 PM 146.79- /147.945- /147.180+ linked • SCCARC 10 Meter Net Monday 7:00 PM 28.308 MHz USB
ARES Net	SC County Wide ARES Tuesday 7:30 PM on 147.180+ PL 94.8 and 443.600+ PL 110.9 linked
San Lorenzo Valley	WR6AOK 147.120+ PL 94.8 Ben Lomond • SLV Net Thursday 7:30 PM
Loma Prieta	AB6VS 440.550+ / AE6KE 146.835- PL 94.8 (linked for net) • LP ARES / LPARC Net Tuesday 7:15 PM
Monterey	K6LY 146.97- PL 94.8 / 444.700+ PL123 (linked for net) Monterey • Monterey Co. ARES Net Wednesday 7:30 PM K6LY 146.970- (PL 94.8) • NPSARC Net Wednesday at 8 PM on K6LY/R
LPRC	WR6ABD 146.640- PL 162.2 / 442.900+ PL 162.2 (winsystem.org) • LPRC Net Tuesday 8:00 PM 146.640-(PL 162.2) • Amateur Radio Newslines broadcast Tuesday

• Santa Clara Valley Section Traffic NET Tuesday 9:00PM 146.640- (PL 162.2)

FOR MORE INFO SEE: <http://www.k6bj.org/freq.html>

### SCCARC Calendar of Events

ARES Meeting (prior to club meeting)	Friday Jan 17
SCCARC Meeting	Friday Jan 17
Cake Meetings	Sat Jan 11, 25
Board Meeting	Thur Jan 23
Short Skip articles due	Jan 6, Feb 10
SCCARC Meeting	Friday Feb 21

### MONTHLY MEETINGS.

The SCCARC Meets at 7:30 PM, on the THIRD FRIDAY of the each month (except December). Meetings are at Dominican Hospital, Education Center, 1555 Soquel Drive, Santa Cruz

### Net Control Schedule:

12/16	Phil KE6UWH
12/23	Tom K6TG
12/30	Lou NJ6H
1/6	Becky KI6TKB
1/13	Chris KG6DOZ

Short Skip is published 12 times per year.  
Free to members.

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Writer: Ron Skelton, W6WO

## Time to Renew

SCCARC Membership Renewals Due January 1; Request for Updates  
If you have already renewed your membership for 2014, thank you! If you haven't, please do it now. Annual dues are \$25 for full members, \$6 each for each additional member at the same mailing address, and \$10 for full-time students age 18 or under. Dues may be paid in cash or check (payable to SCCARC) in person, at regular Club meetings, or checks may be mailed to SCCARC, P.O. Box 238, Santa Cruz, CA 95061-0238.



SANTA CRUZ COUNTY AMATEUR RADIO CLUB  
P.O. BOX 238  
SANTA CRUZ, CA 95061-0238

## Special Events continued

was not only fun to do this, but I think that we helped raise awareness about polio around the world.

Whatever your reason for holding a special event, you'll want to be somewhat knowledgeable about your topic. For example, if you decide to set up a special event station at the local Rutabaga Festival, you might want to know how long they've been having the

festival, how many pounds of rutabagas are produced by local farms and around the U.S., and maybe even find a couple of rutabaga recipes that you could send out to stations that work you.